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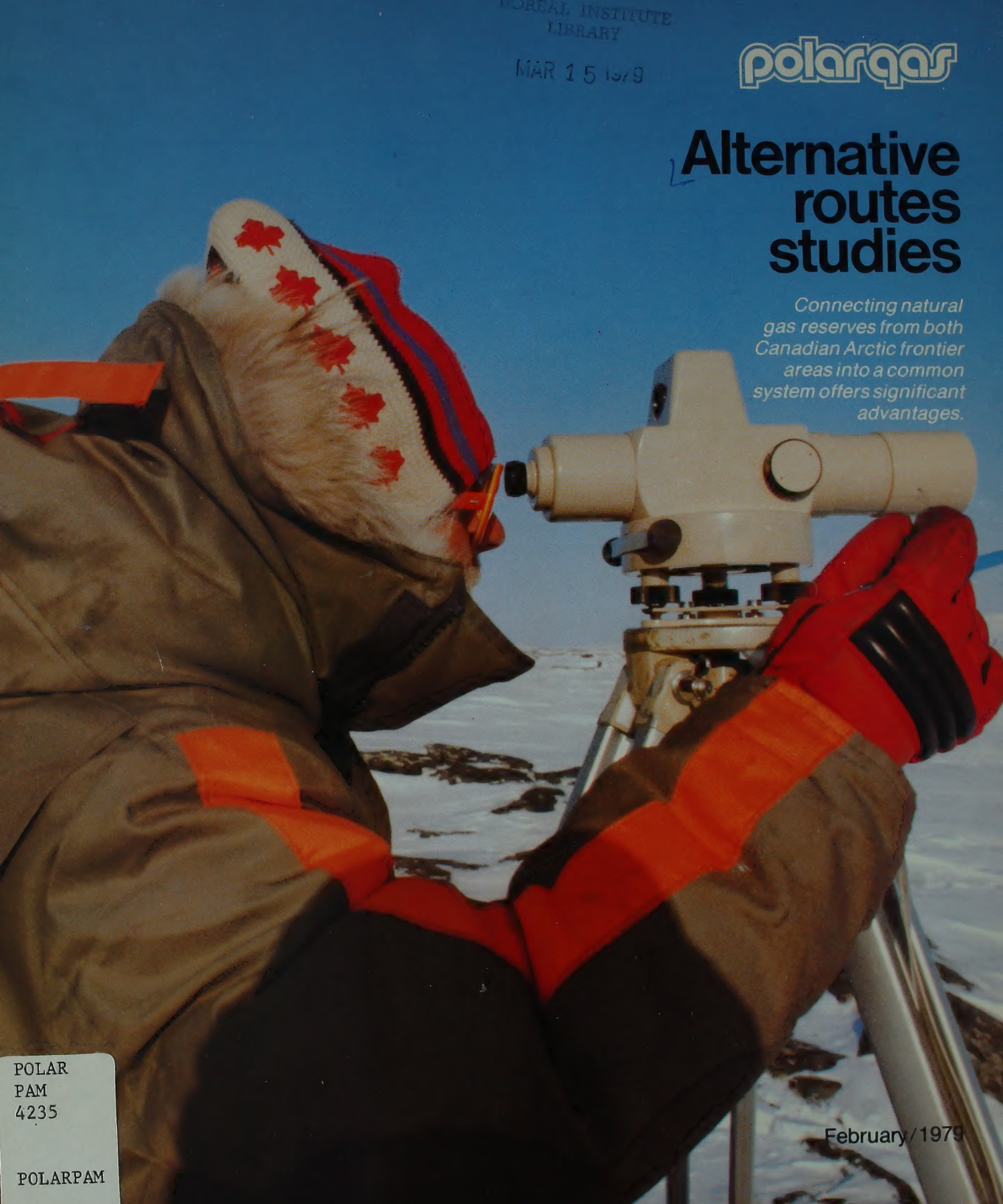
Alternative routes studies

Connecting natural gas reserves from both Canadian Arctic frontier areas into a common system offers significant advantages.



February/1979

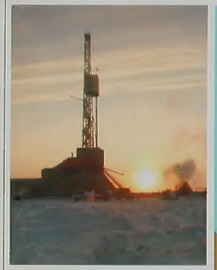
Reserves and potential

Recent technological advances in marine pipelaying make it possible to consider new routing options for the transportation of Arctic Islands' natural gas. The ability to lay pipe at greater depths and for longer distances has allowed Polar Gas to make a preliminary examination of a new routing via M'Clure Strait and Victoria Island onto the Canadian mainland near Coppermine, N.W.T. The major advantage offered by this new routing is the possibility of combining natural gas reserves from the Arctic Islands with those from the Mackenzie Delta and the Beaufort Sea into a single transportation system.

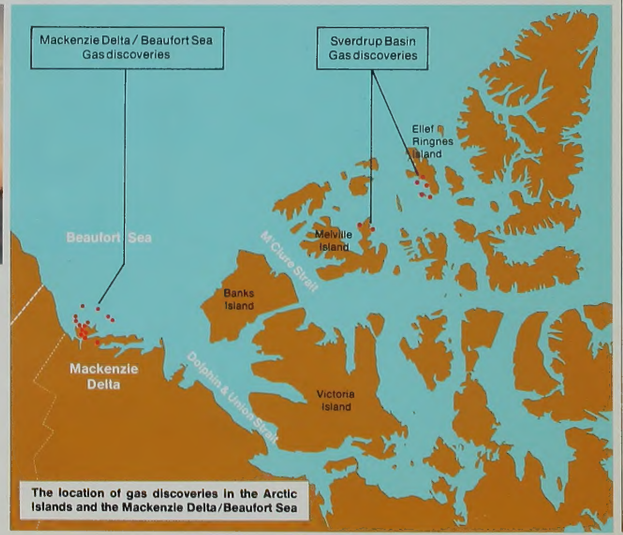
At present, neither of these areas has sufficient reserves to support a pipeline. But, in combination, the total established reserves in the Arctic Islands and the Delta/Beaufort Sea area are already very close to that required for a pipeline—with total marketable reserves in these two frontier areas currently estimated in the range of 439 to 524 billion cubic metres (15.5 to 18.5 Tcf).

Future potential is very encouraging. The federal department of Energy, Mines and Resources, in a report published in 1977, estimated an ultimate potential (50% probability) of 1,699 billion cubic metres (60 Tcf) in the Delta/Beaufort Sea area. The same report shows that the Arctic Islands ultimate potential is greater than 1,416 billion cubic metres (50 Tcf).

Greater established reserves and increased ultimate potential are two of the advantages of connecting natural gas reserves from both northern Canadian frontier areas into a common gas transportation system.



(Above) The Arctic Islands and the Mackenzie Delta/Beaufort Sea have established marketable reserves currently estimated in the range of 439 to 524 billion cubic metres (15.5 to 18.5 Tcf)—very close to the threshold required for a pipeline.



The location of gas discoveries in the Arctic Islands and the Mackenzie Delta/Beaufort Sea

Recent advances in technology

As petroleum and natural gas supplies on land have become increasingly scarce, the petroleum industry has moved "offshore" in its search for hydrocarbons. While industry activity has moved into deeper and more inhospitable areas of the world's oceans, equipment development to handle the job of pipelaying has more than kept pace. Marine technology advances, since Polar Gas research activities began in 1972, make it possible to now consider alternative routing options for the transportation of Arctic Islands' gas.

Water depths are no longer a major barrier. In 1976 and 1978 laybarges installed pipe to depths of approximately 396 metres (1,300 feet) and current plans are to install pipelines in excess of 549 metres (1,800 feet).

In 1978, Panarctic Oils successfully applied the bottom pull technique of pipelining in the Arctic environment. A pipeline was pulled along the seabed using winches on the ice surface to connect the sub-sea well by pipeline to onshore facilities on Melville Island.

The crossing distances by bottom pull methods can be extended by connecting several strings of pipeline together. The connection of these strings is now possible by several methods—both on the surface and on the seabed.

The application of these and other technological advances in the construction of marine pipelines has allowed Polar Gas to consider an alternative routing via M'Clure Strait.

(Above) In order to obtain information for the hydrology program, researchers will use augers to drill holes in the ice surface. These sample holes will be used to obtain measurements of water depth, ice thickness and current flow.

(Above) Special diving chambers can be positioned on the sea bottom to allow pipe to be welded under atmospheric conditions.

(Left) Panarctic Oils recently demonstrated that offshore Arctic wells can be completed and connected by a flow line to onshore facilities. Shown here is the rig-up of a 1,220-metre (4,000-foot) pipeline length that was pulled into place on the seabed by a winch supported on an artificially-thickened ice surface.

Further studies

While current marine pipelaying methods appear to make a new routing option feasible, additional information is required on the nature of M'Clure Strait (between Melville Island and Victoria Island north of the Canadian mainland).

Polar Gas field studies of M'Clure Strait have been initiated to get comprehensive information of the channel bottom profile, sub-bottom characteristics, ice conditions in the strait as well as water temperatures, tides and currents.

This bathymetric data is needed to determine the most acceptable route across the channel, to establish the technical feasibility of installing pipe along the route, and finally to confirm the cost of constructing a crossing at M'Clure Strait.

Technological advances in sub-sea pipeline connections will also be studied. Other engineering programs will include a geotechnical overview of the route to gather data on the types of subsoils, and hydrology studies to collect information on the nature of the rivers along the new route. Studies will be continued to optimize, update and refine construction, logistics and design plans for the proposed pipeline system.

If 1979 field programs confirm the feasibility of the M'Clure Strait crossing, marine crossing costs would be substantially less. Only two crossings are involved, rather than the five on the route applied-for in late 1977. The new routing would also offer improved and lower cost logistics, due to the existence of transportation facilities that serve much of the area under consideration.

Preliminary investigations also indicate that it may be possible to make significant reductions in construction time.

A detailed review of available environmental and socio-economic information along the possible alternative route is also being carried out.

(Above) Analysis of core samples will help determine the sub-bottom characteristics of M'Clure Strait.

(Far Left) On-the-spot data reduction will allow researchers to immediately determine the nature of the bottom of M'Clure Strait and make routing re-alignments if the bottom is unsuitable for pipelining.

(Left) Tracked vehicles will record continuous profiles of the channel bottom.

Alternative routes studies announced

Excerpts from testimony by John D. Houlding, President and Chief Executive Officer of Polar Gas, before the NEB's Natural Gas Supply/Demand Hearing, December 1, 1978, Ottawa, Ontario.

As a result of recent significant technological advances in deep sea pipelaying technology, additional new route options for the transportation of Arctic Islands' gas now appear to be available and we would like to bring this development to the attention of the Board.

* * *

The ability to construct a marine pipeline at greater depths and for longer distances than before has allowed us to make a preliminary examination of a new routing via M'Clure Strait and Victoria Island onto the mainland near Coppermine, and then southeastward to an interconnection with existing systems. Our consultants have provided a preliminary opinion that the crossing of M'Clure Strait is technically feasible. Field work will be carried out early in 1979 to study the bathymetry of this strait and to confirm this opinion.

* * *

Our preliminary examination has revealed a number of potential advantages. The major and most logical advantage offered is the possibility of combining gas reserves in the Arctic Islands with those in the Mackenzie Valley and Beaufort Sea area into a single transportation system. The total established reserves in these two areas are already very close to that required to support a pipeline.

* * *

Another potential advantage was revealed in our preliminary study of the capital cost of such a routing. It appears that these two resource areas can be combined in a single transportation system at a capital cost approximately the same as that calculated for the applied-for-route.

Significant savings could be realized in the marine crossing costs, which should be substantially less because only two crossings are involved rather than five in the case of the applied-for-route. Improved and lower cost logistics are available due to the existence of transportation facilities to serve much of the area now under consideration for an alternative route. Our preliminary investigations also indicate that it may be possible to make significant reductions in construction time.

* * *

The application of more recent technological advances in the construction of marine pipelines has allowed Polar Gas to extend its studies to examine new and possibly improved routing alternatives. This latest development offers the exciting prospect of combining Canada's two largest frontier resource areas in a common system. It also offers the possibility of bringing on significant volumes of frontier gas by the late 1980s, when they will be needed, as indicated in our submission to this Board.

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Depending on the results of these alternative routing investigations, we may file another application that would supersede our existing application.